

**Remarks/Arguments:**

Claims 1-8 are pending and rejected in the application. Claims 1 and 5 have been amended. No new matter has been added.

On page 2, the Official Action rejects claims 1-8 under 35 U.S.C. §103(a) as being unpatentable over Kawamoto (JP 410109163) in view of Blankenship (U.S. 6,248,976) and further in view of Churchward (U.S. 1,687,492). It is respectfully submitted, however, that the claims are patentable over the art of record for at least the reasons set forth below.

Applicants' invention, as recited by claim 1, includes features which are neither disclosed nor suggested by the art of record, namely:

**... wherein, the short-circuit waveform control circuit controls the welding voltage to decrease when the arc resistance exceeds a resistance threshold, controls the welding voltage to increase and the short-circuit period to decrease when the arc resistance is below the resistance threshold, and**

**... the arc waveform control circuit controls the welding current to be held at a constant level when the arc resistance exceeds the resistance threshold, the constant level current being greater than a normal welding current generated based on the welding voltage**

Claim 1 relates to controlling both the voltage and current of the welding power based on the arc resistance. For example, the short circuit waveform control circuit controls the welding voltage to increase and decrease based on the arc resistance while the arc waveform control circuit controls the welding current to be held at a constant level when the arc resistance exceeds the threshold. Support for these features are shown in Applicants' Figs. 1, 3 and 4 and described on pages 8-14 of Applicants' specification. No new matter has been added.

Kawamoto suggests an electrode arc welder. Specifically, the system shown in Figs. 1 and 4 of Kawamoto include a short circuit waveform control circuit, an arc waveform control circuit and a constant current control circuit (i.e., Kawamoto does not suggest an arc resistance calculator).

In similar art, Blankenship suggests an arc welder controller which is able to compute the arc resistance based on measurements of voltage and current. Thus, the Examiner's

attempts to combine the resistance calculator of Blankenship, and the constant current level of Churchward with the controllers taught by Kawamoto.

As described on pages 2 and 3 of Applicants' background, conventional systems such as the one taught by Kawamoto only control the voltage in the arc period and only control the current in the short circuit period (i.e., the voltage is not controlled in the short circuit period). Problems due to uncontrolled voltage or current (e.g. micro short circuits during welding and flattening of drip at the tip end of the wire during the arc period) may occur. Thus, in the conventional systems, during the short circuit period, the voltage is left uncontrolled whereas during the arc period the current is left uncontrolled which lead to problems.

Applicants' claim 1 is different than the art of record, because both the voltage and current are controlled based on the arc resistance ("*... wherein, the short-circuit waveform control circuit controls the welding voltage to decrease when the arc resistance exceeds a resistance threshold, controls the welding voltage to increase and the short-circuit period to decrease when the arc resistance is below the resistance threshold ... the arc waveform control circuit controls the welding current to be held at a constant level when the arc resistance exceeds the resistance threshold, the constant level current being greater than a normal welding current generated based on the welding voltage*").

As shown in at least Figs. 1, 3 and 4, arc resistance calculator 1 provides a resistance signal S6 to short circuit waveform control circuit 8 and arc waveform control circuit 9. Short circuit waveform control circuit 8 controls the voltage in the short circuit period, and arc waveform control circuit controls the current in the arc period. Accordingly, for the reasons set forth above, claim 1 is patentable over the art of record.

Independent claim 5 includes similar features to claim 1. Thus, independent claim 5 is also patentable over the art of record for at least the reasons set forth above.

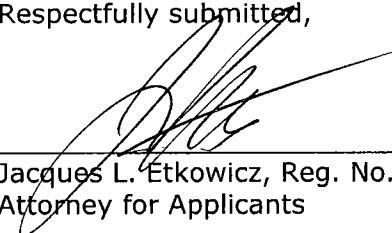
Dependent claims 2-4 and 6-8 include all of the features of the claims from which they depend. Thus, these claims are also patentable over the art of record for at least the reasons set forth above.

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In view of the amendments and arguments set forth above, the above-identified application is in condition for allowance which action is respectfully requested.

Respectfully submitted,

  
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